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# Development and characterisation of depleted monolithic active pixel sensors (DMAPS) in 150 nm and 180 nm CMOS technology

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Monolithic active pixel sensors featuring depleted substrates (DMAPS) present a promising alternative for pixel tracker detectors operating in high-radiation and high-rate environments. The utilization of high-resistivity silicon substrates and high-voltage capabilities within commercial CMOS technologies holds the potential to significantly enhance radiation tolerance with respect to MAPS. TJ-Monopix2 and LF-Monopix2 chips are the most recent large-scale prototype chips in their respective development line with a column-drain readout architecture.

Designed in 150 nm LFoundry technology, LF-Monopix2 uses a large charge collection electrode with pixel electronics embedded in it. Benefits of this design are short drift paths and a homogeneous electric field across the sensor that increase the radiation tolerance. Optimization of
the pixel layout minimizes potential coupling from the digital circuitry into the sensor node while reducing the pixel size to 50 x 150 um² compared to its predecessor.

TJ-Monopix2 is designed in 180 nm Tower Semiconductor technology. Featuring a small charge collection electrode design with separate readout electronics, the pixel pitch of this sensor could be reduced to 33 x 33 um². A small detector capacitance allows for a large signal-to-noise ratio while an additional n-type layer across the pixel ensures full depletion of the sensitive volume.

In this talk, an overview of both DMAPS developments including results from tests in laboratory and using a minimum ionising particle beam is given. For TJ-Monopix2, timing studies and charge collection measurements are highlighted. For LF-Monopix2, the performance after irradiation to fluences of up to 2e15 neq/cm² is shown.

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